Surgical Treatment of Acoustic Neuroma with Preservation or Reconstitution of the Facial Nerve*

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The treatment of the innocent acoustic neuroma has, in a sense, been the most challenging of all intracranial tumors during the recent history of neurological surgery. Although readily accessible by a posterior fossa approach, its intimate involvement with the brain stem, cerebellum, cranial nerves, and the vessels irrigating these structures has taxed the ingenuity of the finest surgeons.

History

The early surgical treatment was done primarily on very ill patients who had far-advanced large tumors and consisted of an intracapsular removal of the bulk of the tumor, as described by Cushing. Subsequently, encouraged by the reports of Dandy, Olivecrona and McKenzie concentrated on and developed the modern technique for safe complete extirpation of the tumor. The extent of the problem was indicated by an over-all mortality of 25% in 300 cases in the hands of Olivecrona who pioneered efforts to save the facial nerve. McKenzie's concentration on the difficulties posed by this tumor resulted in a mortality of 12.5% in 142 patients. In these advanced cases, much of the neurological dysfunction due to the mass of the tumor was irreversible. Hemorrhagic softening of the brain stem was the chief cause of operative mortality and morbidity, and resulted from injury to the anterior inferior cerebellar artery. This vessel usually is intimately related to the tumor which it supplies with blood; it also has a wide field of irrigation in the adjacent brain stem.1 The facial nerve was sacrificed more often than not in the interest of safe tumor removal, and the clinical results of facial nerve anastomosis to the hypoglossal, accessory, or phrenic nerves were barely acceptable.

Partial removal was practiced in older pa-

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459
important, it should in no way jeopardize the life or function of the patient or the completeness of the extirpation. The major disadvantage of this lateral approach is that the most important part of the dissection, along the brain stem, is hidden from the operator by the tumor mass. It is here that all the troubles from operation have arisen, even with the direct access of suboccipital exposure.

It is unlikely, even inconceivable, that with a large tumor the transpetrous route will result in less injury to the ninth and tenth nerves, the pons, and the medulla, or avoid the devastating infarction of the brain stem and cerebellum unless the anterior inferior cerebellar artery is seen and preserved. There is no doubt that this part of the dissection must be done under direct vision. Rand and Kurze23 have pointed out that, in addition to the limited field of action, total hearing loss is produced prior to the identification of a tumor unless the middle fossa approach is used. There is no opportunity to reconstruct the facial nerve if involved by tumor and there is an increased risk of a CSF leak. If partial removal is indicated, there is no need for the extensive translabyrinthine procedure to spare facial action. The operation would be more radical and safe through the posterior fossa.

Analysis of Cases

An analysis of House’s cases14 (Table 1) reinforces these contentions. The size of an acoustic neuroma is unquestionably the most important factor as far as the safety of the surgical treatment and the clinical picture is concerned. For the purpose of comparing the House series with ours, we have created four categories:

1. Involvement of the auditory nerve only (C-VIII).
2. Involvement of the auditory and trigeminal nerves (C-VIII and C-V).
3. Involvement of C-VIII and C-V and the cerebellum.
4. Involvement of C-VIII, C-V, cerebellum, and the glossopharyngeal and vagus nerves (C-IX and C-X).

Categories 1 and 2 involve small tumors while Categories 3 and 4 are associated with large angle masses. Preoperative impairment of the facial nerve is usually slight, even with large tumors, and therefore was not included in this categorization.

It can be seen from Table 1 that House’s operations were all on tiny or small tumors. This is a tribute to modern otological and radiological diagnosis. On the other hand, only 2 of the 30 neurosurgical cases were small tumors; the remainder were large, and 12 (40%) had choked discs. Three were bedridden (2 with hemiparesis), and 4 others could not walk unaided because of ataxia. Therefore, any comparisons made between the otological operations or small tumors and the standard neurosurgical procedure for the average large tumor are invalid and misleading.

It can also be seen that the factors mitigating against the transpetrous operations for large tumors (vide supra) are also important with small angle tumors. Three of 4 middle fossa operations and 12 of 13 translabyrinthine operations resulted in incomplete removal of tumors just large enough to compress the trigeminal nerve. The translabyrinthine operation resulted in incomplete removal in 4 cases where only the eighth nerve was involved. Thus, 19 of 50 small tumors (38%) were incompletely removed. It is reasonable to consider that most if not all of these smaller tumors would have been subject to complete removal by the suboccipital approach. The surgical mortality, 2 deaths in 51 cases, is notable. No clearer argument can be used in support of the need for earlier diagnosis and operation when the tumor is small. The only large tumor operated upon died after incomplete removal through a combined middle fossa and translabyrinthine approach. These figures tend to confirm Mayfield’s observation that the otologists are operating upon “ear tumors” while neurosurgeons have been dealing with brain tumors. Even so, our attitude should still be one of admiration for a remarkable piece of work which has aided in diagnosis, led to reassessment of the transpetrous procedures, and emphasized the importance of magnification.

The remarkable report of Hullay and Tomits16 is an indication of the low morbidity and mortality possible with the neurosurgical operation. In their series of 50 patients the tumor was large in 14, medium in 23, and small in 13. Complete extirpation was carried out in every case, with only 2 post-